100

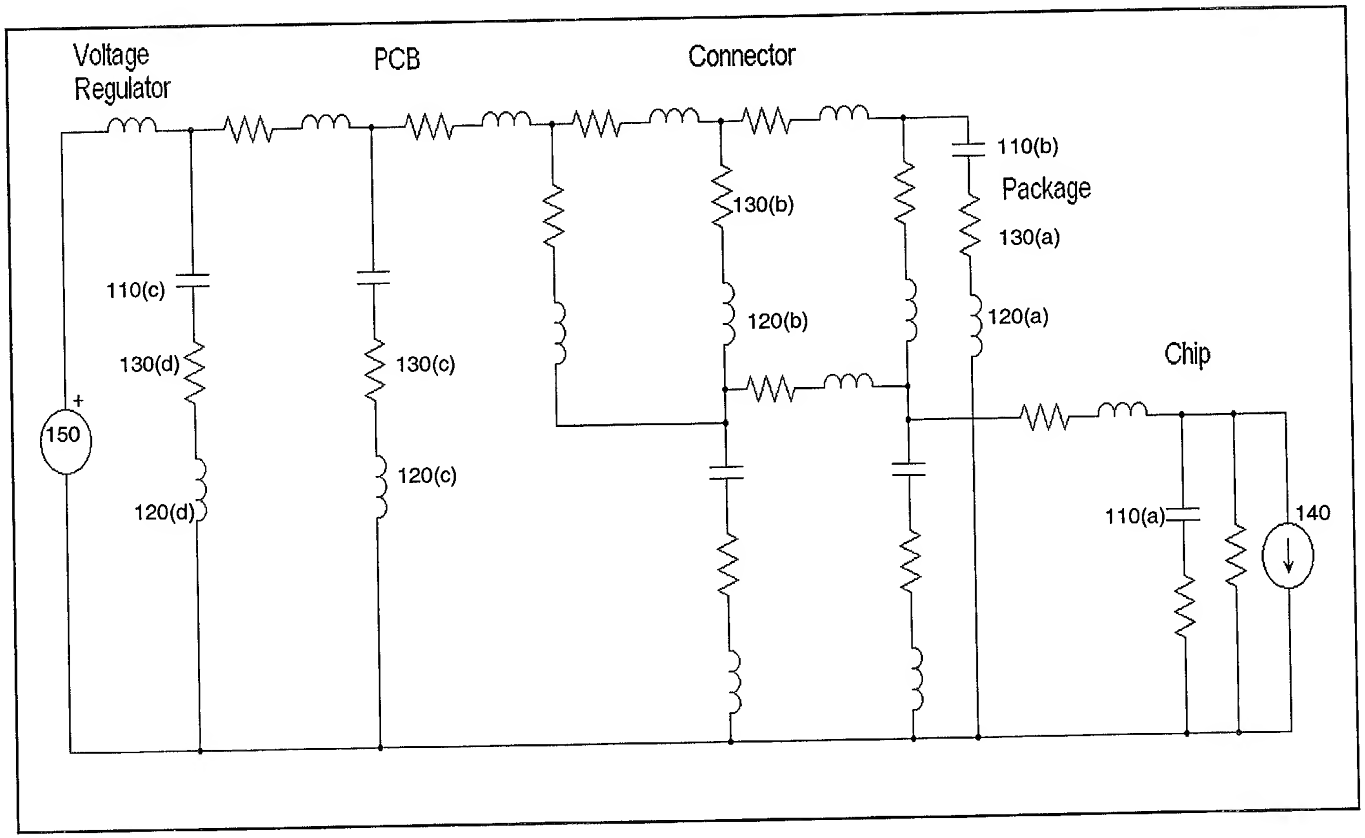
Voltage
Regulator
PCB
Connector
110(b)
Package
130(a)
120(a)
130(b)
120(b)
Chip
110(c)
130(d)
150
+
120(d)
130(c)
120(c)
110(a)
140

Fig. 1

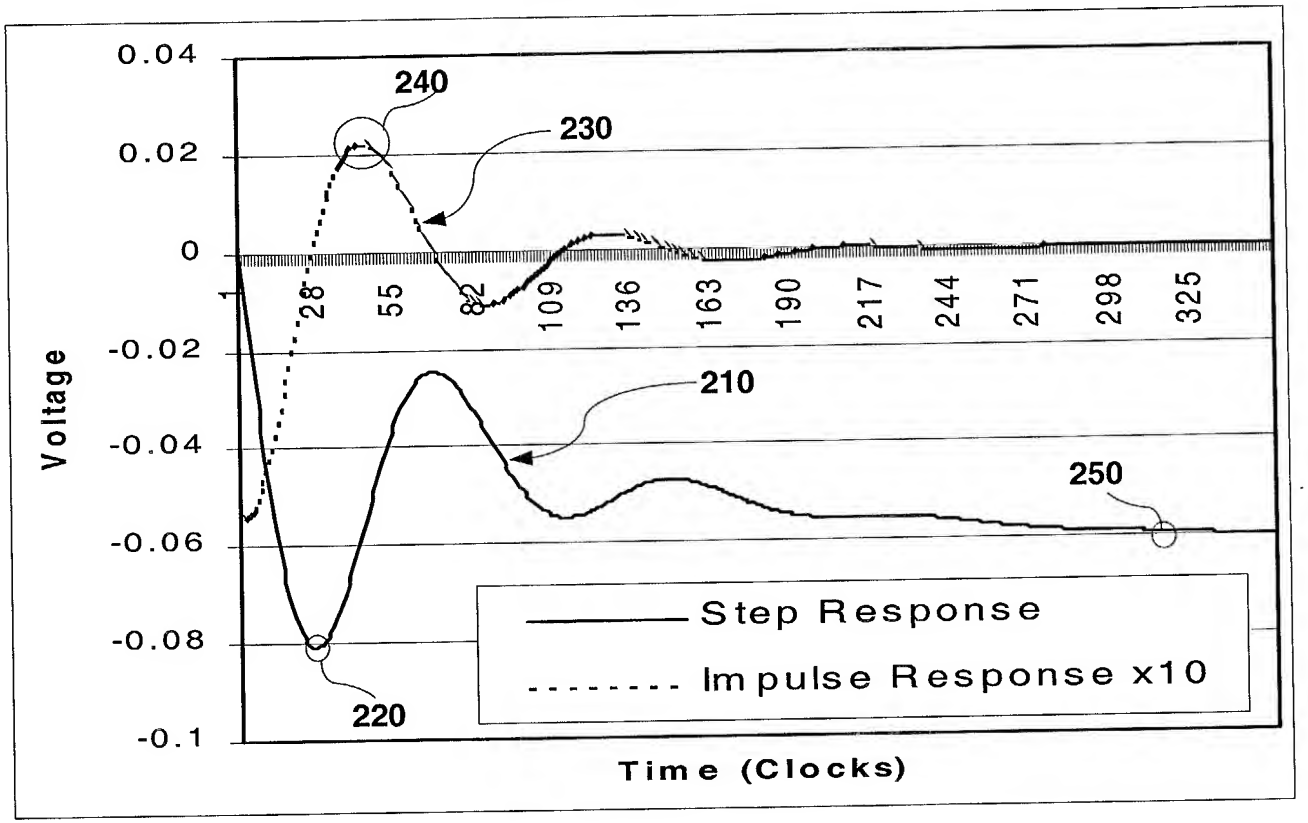

Fig. 2

300

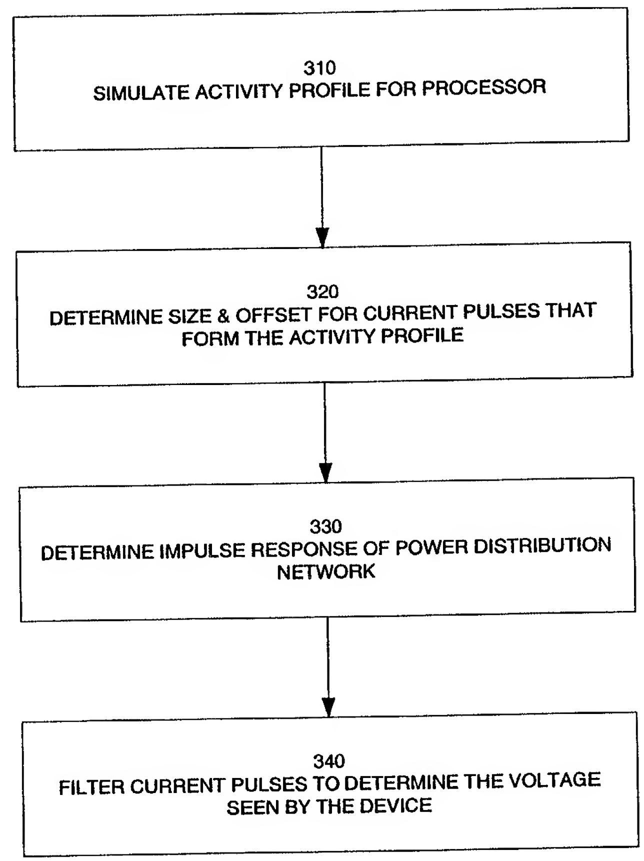
310
SIMULATE ACTIVITY PROFILE FOR PROCESSOR
320
DETERMINE SIZE & OFFSET FOR CURRENT PULSES THAT FORM THE ACTIVITY PROFILE
330
DETERMINE IMPULSE RESPONSE OF POWER DISTRIBUTION NETWORK
340
FILTER CURRENT PULSES TO DETERMINE THE VOLTAGE SEEN BY THE DEVICE

Fig. 3

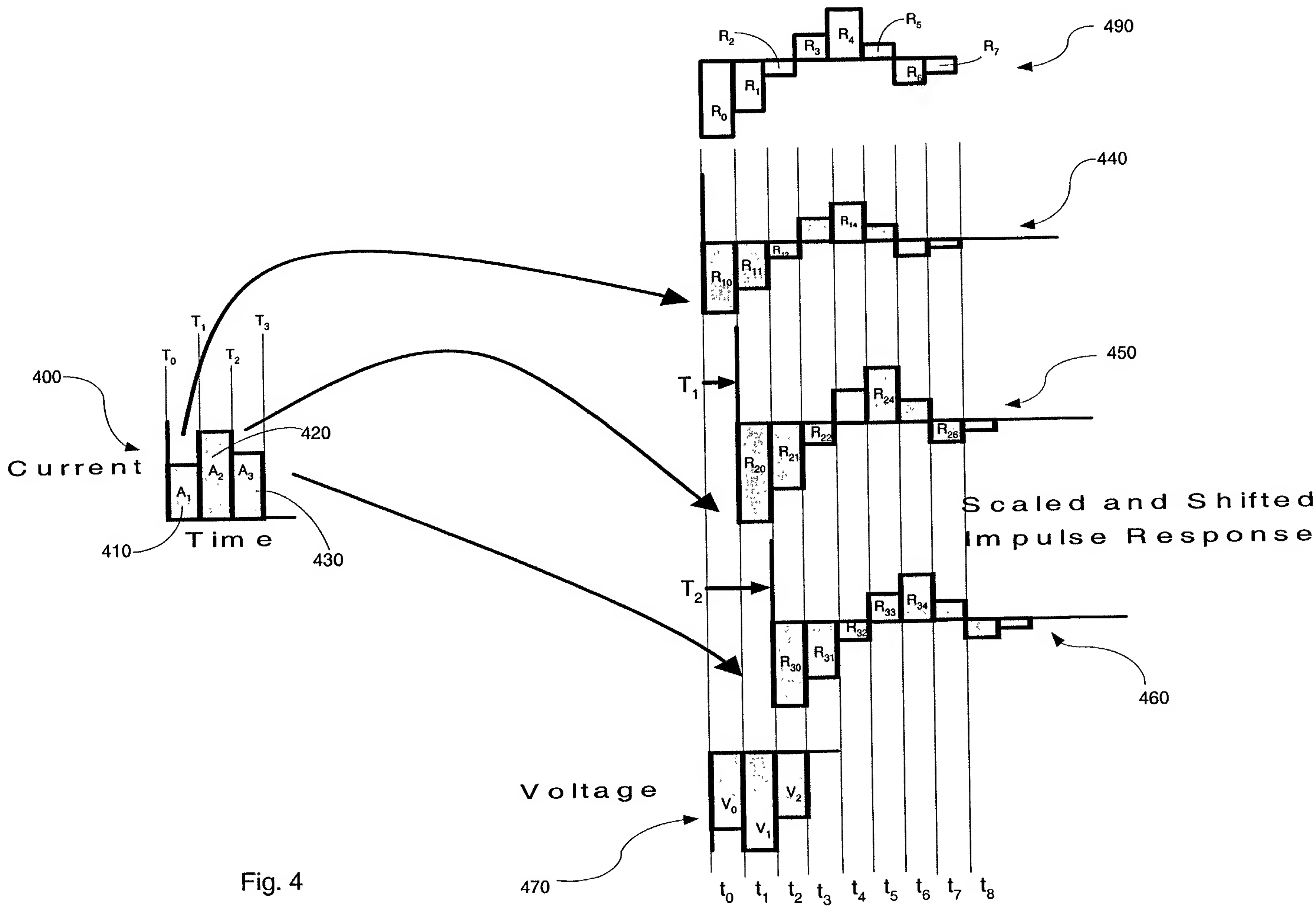
Current
Time
T_0
T_1
T_2
T_3
A_1
A_2
A_3
400
410
420
430
490
R_0
R_1
R_2
R_3
R_4
R_5
R_6
R_7
440
R_{10}
R_{11}
R_{12}
R_{14}
450
T_1
R_{20}
R_{21}
R_{22}
R_{24}
R_{26}
Scaled and Shifted
Impulse Response
460
T_2
R_{30}
R_{31}
R_{32}
R_{33}
R_{34}
Voltage
V_0
V_1
V_2
470
t_0 t_1 t_2 t_3 t_4 t_5 t_6 t_7 t_8

Fig. 4

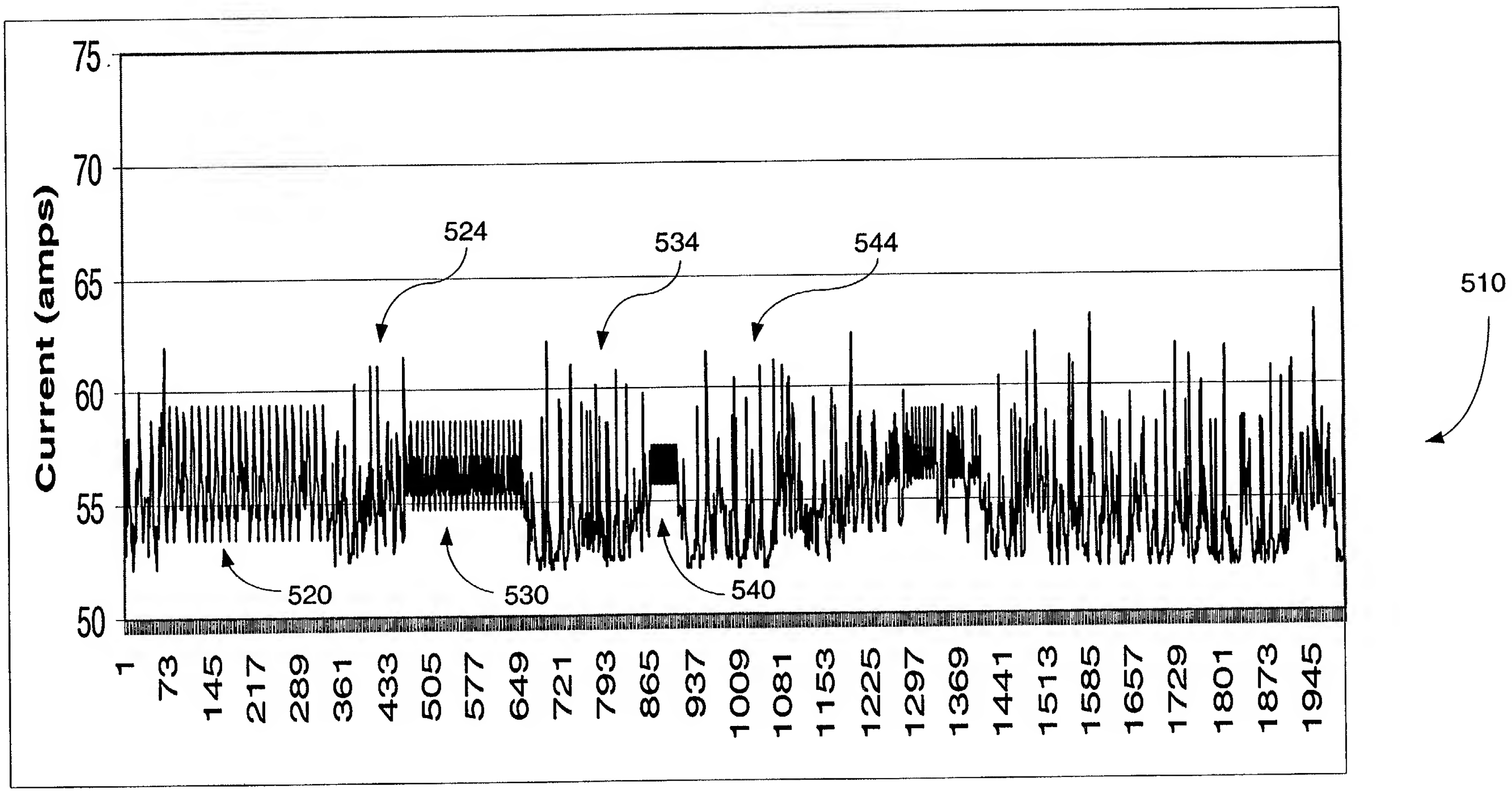
Current (amps)
75
70
65
60
55
50
1
73
145
217
289
361
433
505
577
649
721
793
865
937
1009
1081
1153
1225
1297
1369
1441
1513
1585
1657
1729
1801
1873
1945
520
524
530
534
540
544
510

Fig. 5

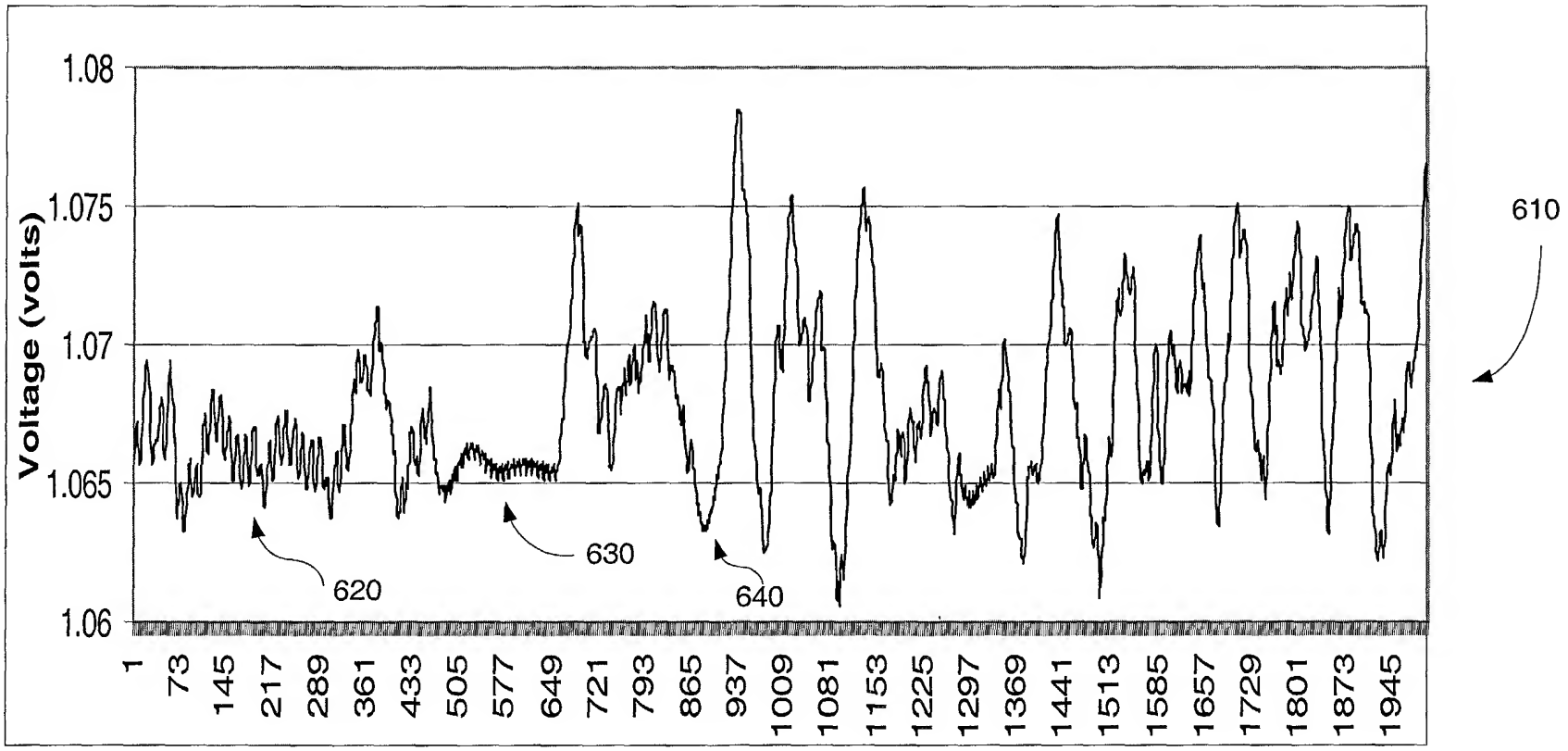
1.08
1.075
1.07
1.065
1.06
Voltage (volts)
1
73
145
217
289
361
433
505
577
649
721
793
865
937
1009
1081
1153
1225
1297
1369
1441
1513
1585
1657
1729
1801
1873
1945
620
630
640
610

Fig. 6

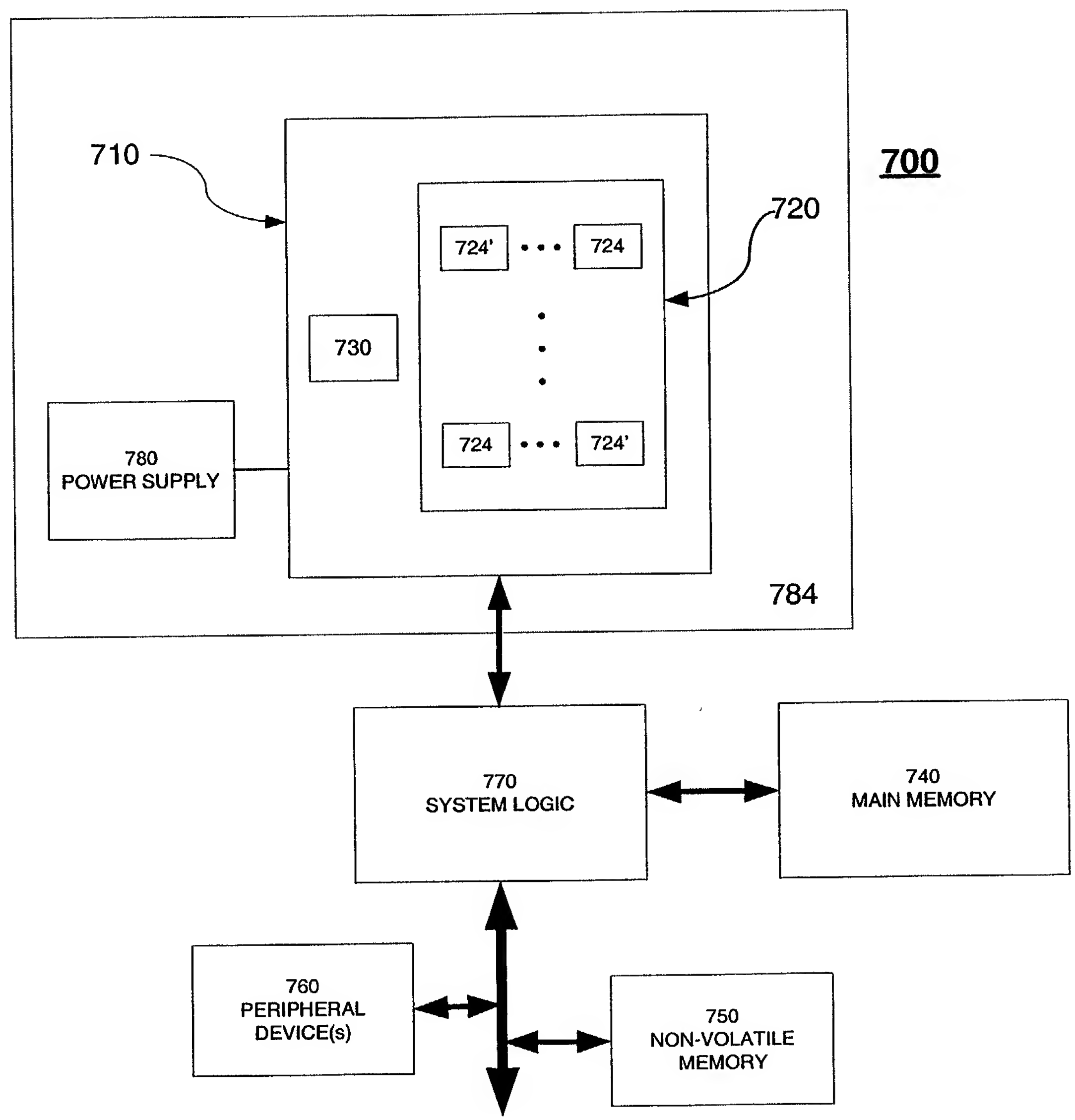
700
710
720
724'
724
724
724'
730
780
POWER SUPPLY
784
770
SYSTEM LOGIC
740
MAIN MEMORY
760
PERIPHERAL
DEVICE(s)
750
NON-VOLATILE
MEMORY

Fig. 7

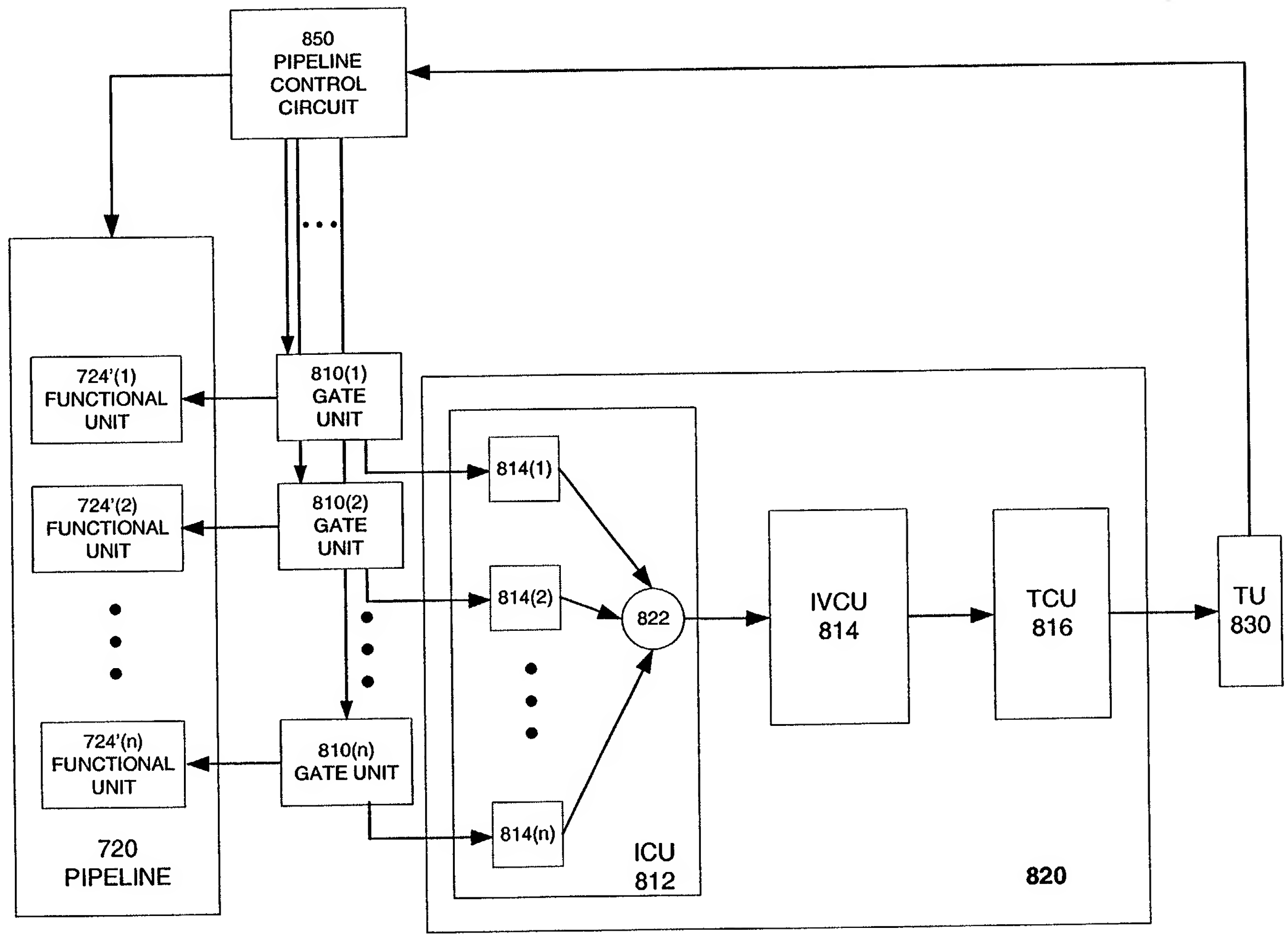
850
PIPELINE
CONTROL
CIRCUIT
724'(1)
FUNCTIONAL
UNIT
810(1)
GATE
UNIT
724'(2)
FUNCTIONAL
UNIT
810(2)
GATE
UNIT
724'(n)
FUNCTIONAL
UNIT
810(n)
GATE UNIT
720
PIPELINE
814(1)
814(2)
814(n)
822
ICU
812
IVCU
814
TCU
816
820
TU
830

Fig. 8A

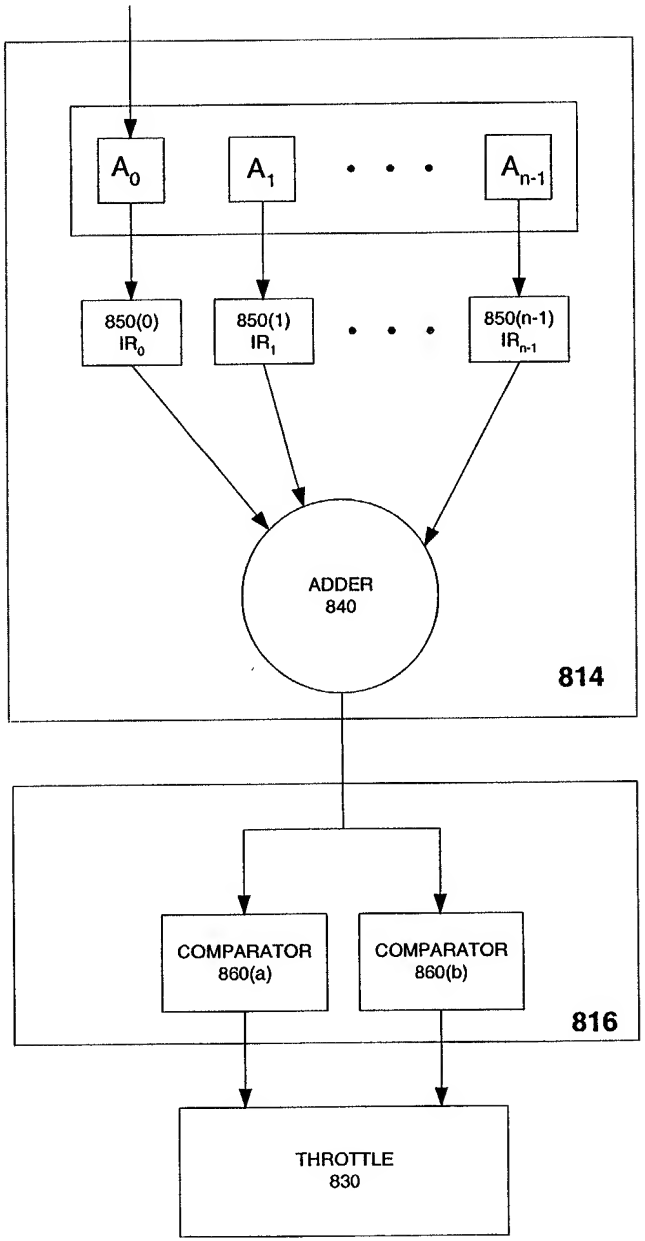
A_0
A_1
A_{n-1}
850(0)
IR_0
850(1)
IR_1
850(n-1)
IR_{n-1}
ADDER
840
814
COMPARATOR
860(a)
COMPARATOR
860(b)
816
THROTTLE
830

Fig. 8B

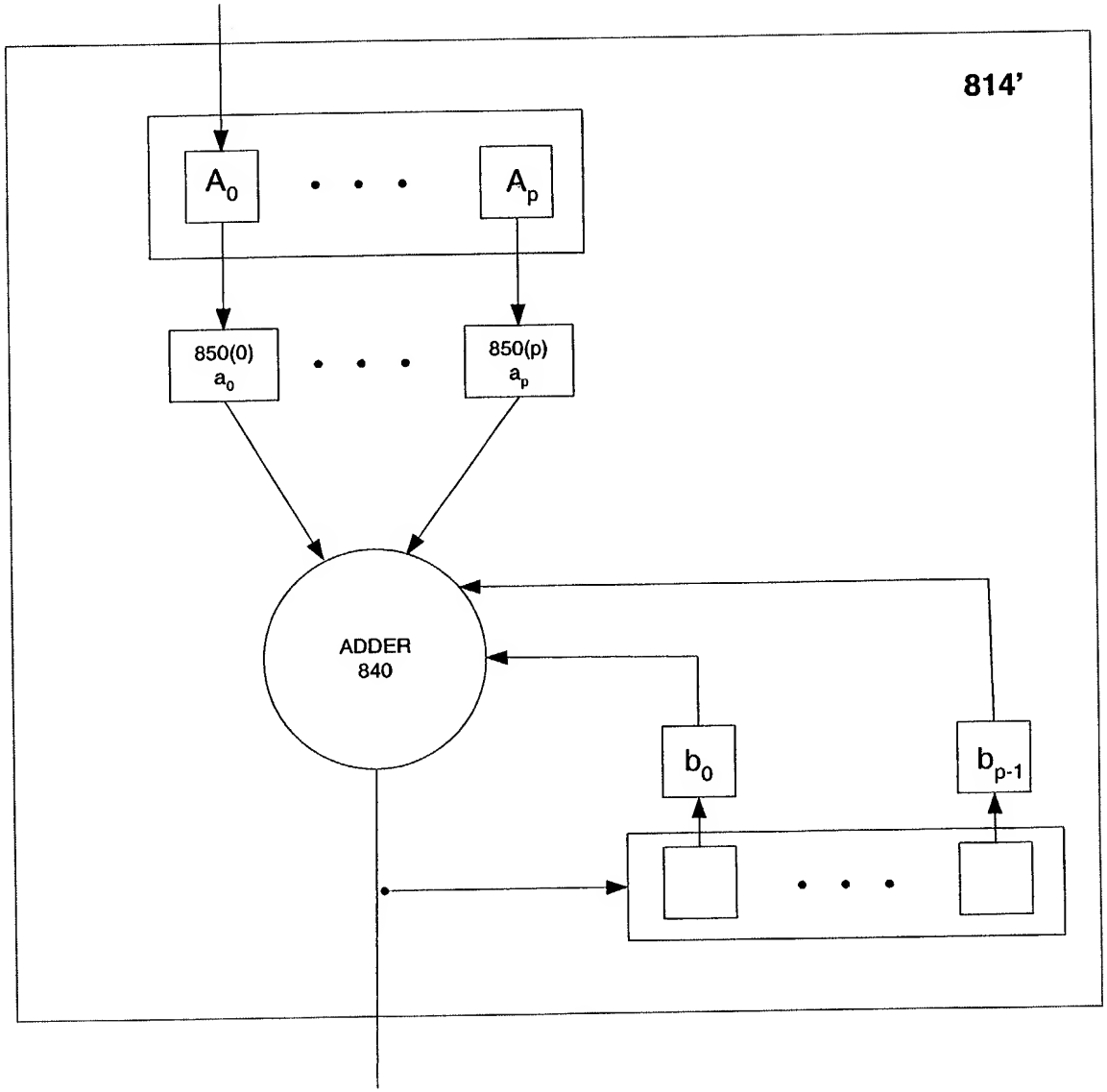

Fig. 8C

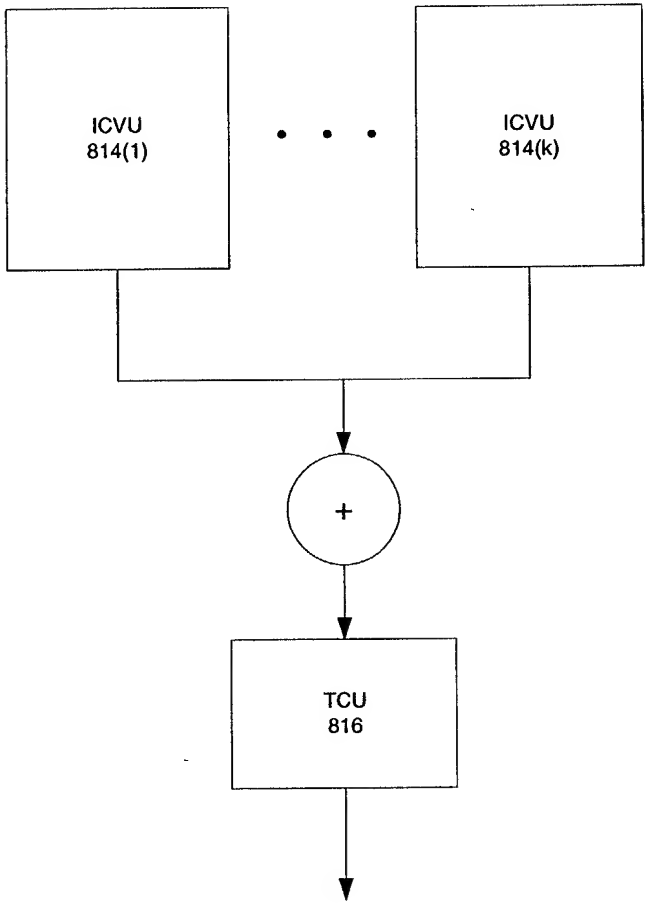

Fig. 8D

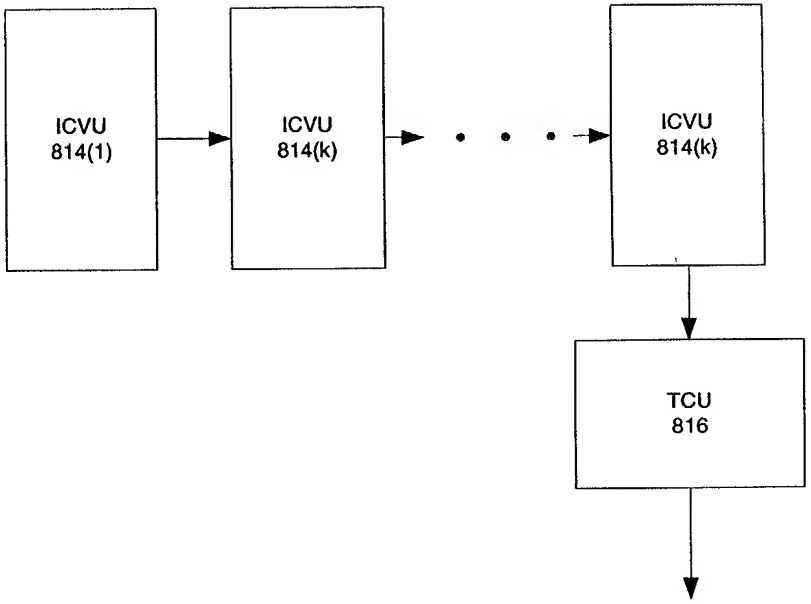

Fig. 8E

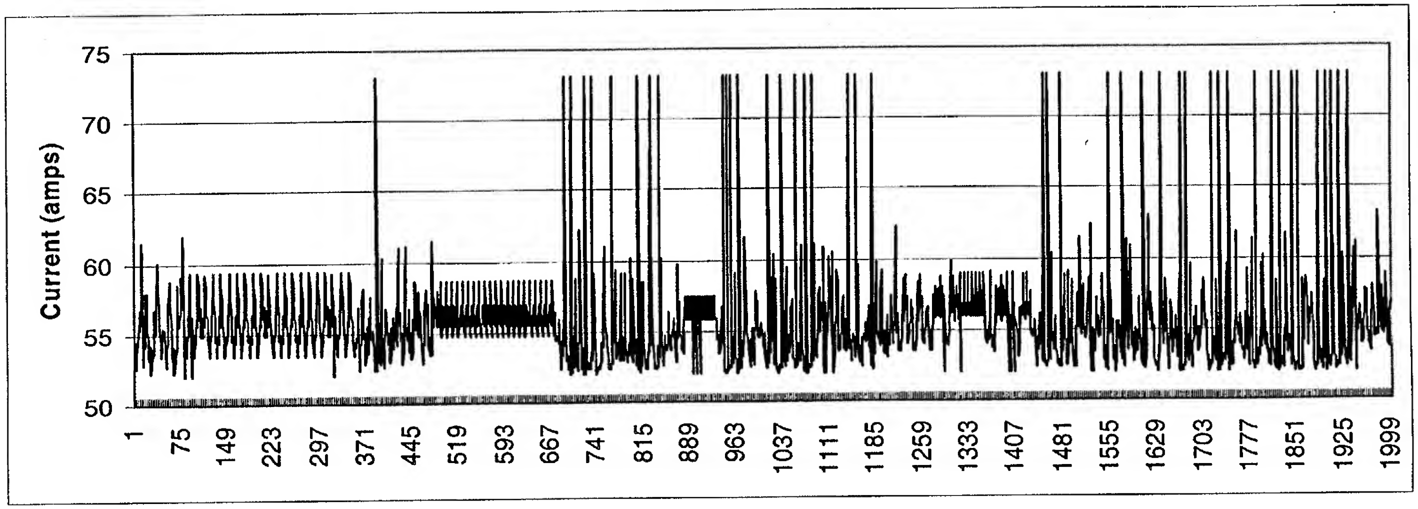
Current (amps)
75
70
65
60
55
50
1
75
149
223
297
371
445
519
593
667
741
815
889
963
1037
1111
1185
1259
1333
1407
1481
1555
1629
1703
1777
1851
1925
1999

Fig. 9

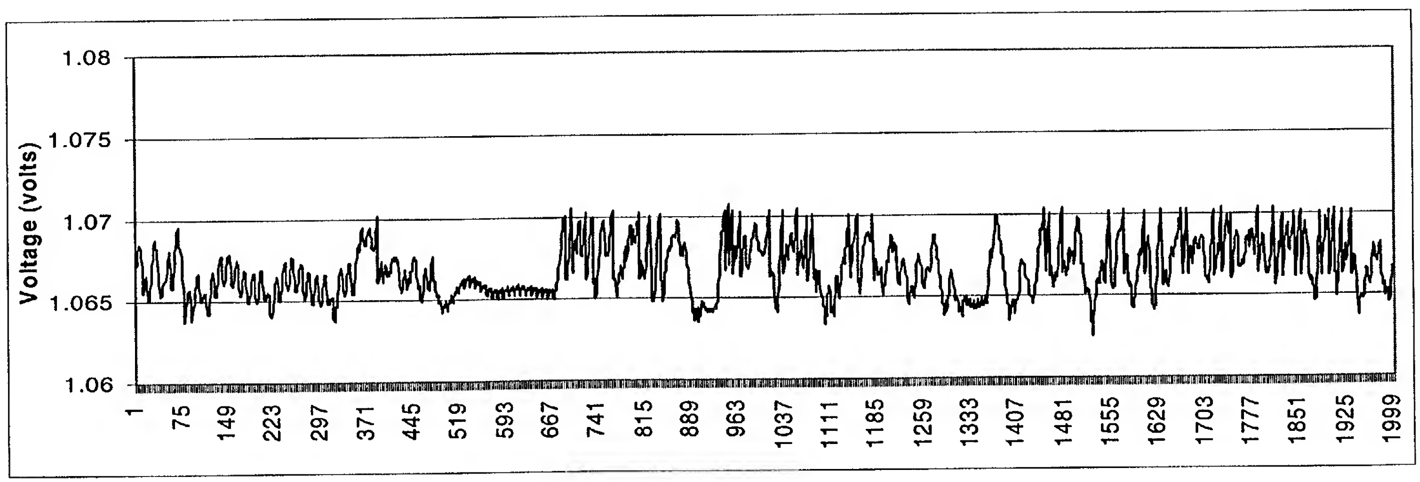
Voltage (volts)
1.08
1.075
1.07
1.065
1.06
1
75
149
223
297
371
445
519
593
667
741
815
889
963
1037
1111
1185
1259
1333
1407
1481
1555
1629
1703
1777
1851
1925
1999

Fig. 10

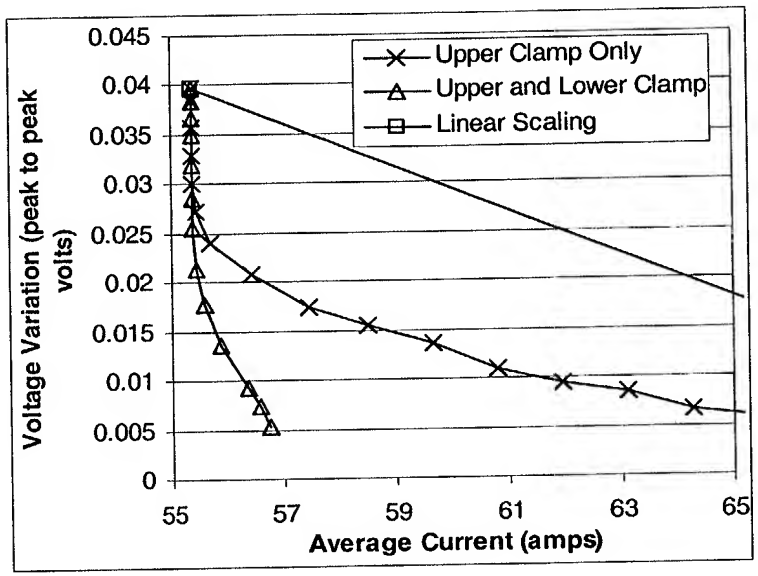
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Voltage Variation (peak to peak volts)
55
57
59
61
63
65
Average Current (amps)
Upper Clamp Only
Upper and Lower Clamp
Linear Scaling

Fig. 11

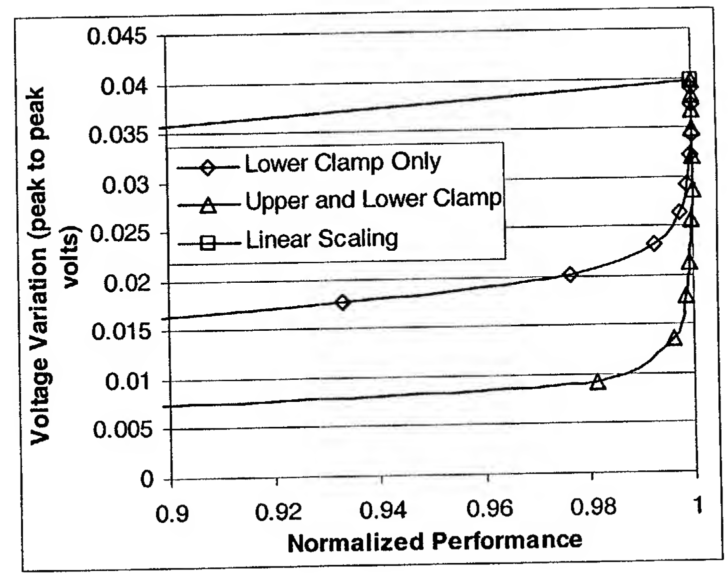
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Voltage Variation (peak to peak volts)
0.9
0.92
0.94
0.96
0.98
1
Normalized Performance
Lower Clamp Only
Upper and Lower Clamp
Linear Scaling

Fig. 12